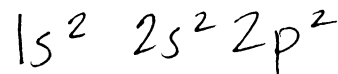


Unless otherwise specified, each question is worth 4 points.

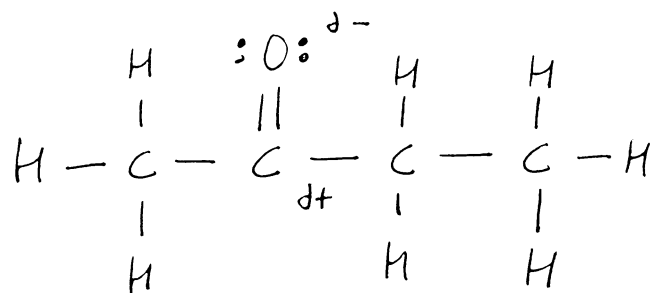
1. Consider the element carbon for these two questions:

- Write the ground-state electron configuration for carbon.
- How many electrons are in the valence shell of carbon?

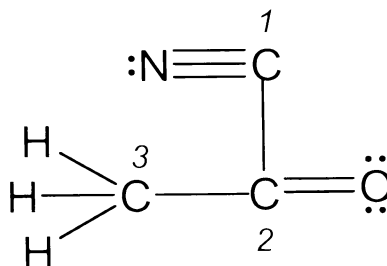


4

2. Draw a complete Lewis structure for butanone (a ketone): $\text{CH}_3\text{COCH}_2\text{CH}_3$. If there are any bonds that are polar, indicate the bond polarity with δ^+ / δ^- symbols.



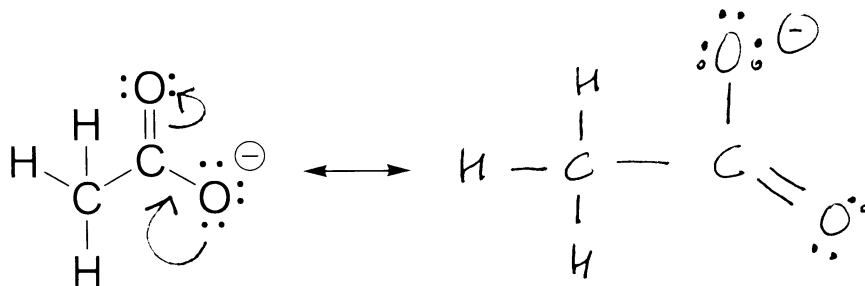
3. Indicate the hybridization and bond angles for each of the following carbon atoms in the Lewis structure shown below:



Carbon atom #	Hybridization	Bond angles
1	sp	180.°
2	sp ²	120.°
3	sp ³	110.°

Unless otherwise specified, each question is worth 4 points.

4. Draw an additional resonance contributing structure for the following ion. Show how the electron pairs are shifted in the structure using the curved arrows convention.



5. On the following molecules, clearly identify one amino, carbonyl, carboxyl and hydroxyl functional group. Note that you can't use the same portion of the molecule for more than one group. (The molecules are the amino acid Serine and the carbohydrate Glucose.)

